FOREST PRODUCTS
Project Fact Sheet

GUIDED ACOUSTIC WAVE MONITORING OF CORROSION AND EROSION IN RECOVERY BOILER TUBING

BENEFITS

- Reduces risk of serious injury and loss of life due to smelt-water explosion
- Decreases annual maintenance shutdown time and improves mill productivity
- Allows economic replacement of tubing

APPLICATIONS

This technology is being developed for routine deployment on recovery boilers. If successful, it will enable safer operation, reduced downtime for maintenance, and safer, more economical operation. Acoustic waves have already been successful in nuclear, chemical, and petroleum industries.

An Acoustic Technology to Provide Cost-Effective and Timely Preventative Maintenance for Recovery Boiler Tubing

Recovery boiler tubes are subject to harsh conditions: furnace temperatures up to 2500 F from combustion on one side, insulation on the other side, and pressurized free flowing water inside the tubes. These circumstances make boiler tubes susceptible to significant erosion and corrosion that threatens safety and presents environmental hazards. Smelt water explosions caused by erosion can be deadly or lead to the release of toxic gases into the environment. The alternative, shutting down the plant for regular tube inspection, is costly and substantially reduces overall mill productivity.

Guided acoustic wave technology has demonstrated its ability to inspect cross-sections of tubes, including bends, in recent experimental applications. Researchers form Lawrence Livermore National Laboratory and Penn State University will examine this new technology's function in detecting erosion and corrosion on recovery boiler tubing in pulp and paper mills. Knowledge of damage location in the pipes, identified by the travel time of wave propagation, could expedite annual inspection time and provide on-line monitoring of tube stability, thereby alleviating environmental, safety, and economic concerns.

Corrosion and erosion caused by harsh recovery boiler conditions often occurs at bends in the tubing

OFFICE OF INDUSTRIAL TECHNOLOGIES
ENERGY EFFICIENCY AND RENEWABLE ENERGY • U.S. DEPARTMENT OF ENERGY

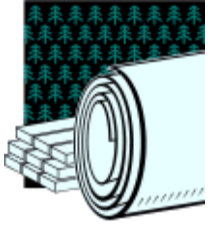
PROJECT DESCRIPTION

Goal: To investigate the use of guided acoustic waves for monitoring and characterizing corrosion and erosion in recovery boiler tubes

The first year of this project will examine the feasibility of using guided wave technology in recovery boiler tubes. The major question is whether webs and attachments interfere with guided wave propagation and interpretation. Contingent upon results of the first year, research in the next two years will focus on development of the application. A prototype system will be tested on a recovery boiler, and commercial application will be pursued based on mill performance.

PROGRESS & MILESTONES

- Industry representatives and principal investigators exchanged detailed information at a kickoff meeting to further characterize the problem and clarify the situation.
- Instruments for use in the experiments were donated.
- Initial studies on machined flaws in tubes without membranes successfully demonstrated the potential of guided wave technology.
- Industry representatives reviewed initial results and gave directives for continued work.
- Tubing panels were manufactured by ABB Combustion and sent to LLNL.
- The propagation of guided wave modes was demonstrated in tubing with membranes.
- Flaws simulating corrosion, cracking, and pitting were introduced into the virgin tubes from ABB.
- Simulated flaws have been successfully detected in a pulse echo method.
- Recovery boiler tubes taken from in-service at Irving Pulp & Paper were acquired.



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